

Agriculture Math Curriculum Framework

Revised November 2011

Introduction

The curriculum framework for Agriculture Math was developed during the 2008-2009 school year in response to a number of requests from local schools. Local schools expressed an interest in Agriculture Math as an option to meet the requirement of a fourth math credit for graduation and the requirement for “extra help” in mathematics required by KRS 158.6459.

This curriculum framework was developed using curriculum funds from the Carl D. Perkins Vocational Education Act administered through the Kentucky Department of Education, Division of Career and Technical Education.

The Committee

The Agriculture Math Curriculum framework was developed by team made up of the following individuals:

Scott Adams, Math Department Chair, Rockcastle County High School
Misty Bivens, Teacher of Agriculture, LaRue County High School
Morrissa Hayes, Math Teacher, Rockcastle County High School
Nicki Jones, Teacher of Agriculture, Harrison County High School
Clay Wells, Teacher of Agriculture, Henderson County High School

Robin Hill and Charma Linville of the Kentucky Department of Education, Office of Teaching and Learning served as consultants to the Committee. Matt Chaliff of the Kentucky Department of Education, Division of Career and Technical Education coordinated this project.

Thanks is extended to each of these individuals for the time, effort, and energy they have devoted to this project.

www.corestandards.org

http://www.education.ky.gov/users/otl/POS/KentuckyCommonCore_MATHEMATICS.pdf

Structure of the Course

The Agriculture Math curriculum framework materials were developed with the idea that this course would most likely be taught to seniors in order meet the fourth math requirement. It was assumed that students would have already learned the math content contained in this course in earlier math courses. Thus the focus of this course is on *applying math knowledge in solving real life agricultural based problems*.

The Agriculture Math course is structured around the five Math Content Strands:

- Number Properties and Operations
- Measurement
- Geometry
- Data Analysis and Probability
- Algebraic Thinking

A broad review of basic information for each of the five content strands is included in this curriculum. This broad review contains basic information related to that strand, formulas, and other pertinent information. It is not intended to be the only teaching material for the strand, but rather an easy reference point for teachers.

A number and variety of **real life, agriculture related problems** are included for each strand. An attempt has been made to cover a broad range of math content within each strand. (While geometry and measurement are two separate strands, most of the practical applications of these concepts fall under measurement. Thus, more problems are listed under measurement than under geometry.) As will be noticed, the problems have varying levels of difficulty and depth. It is hoped that the use of these problems will help students **apply the knowledge of mathematics that they have gained in previous math courses**.

Teachers are encouraged to develop additional agriculture related problems for use in teaching this course. Teachers are also encouraged to adapt existing problems to reflect the content of their agriculture program, the interests of their students, and the agriculture in their region of the state. In doing so, collaboration is encouraged between the math and science departments. This collaboration should ensure that problems have an adequate level of rigor and that they do relate to real life, agriculture.

Number Properties and Operations

Math Standard	Supporting Content	Sample Related Activities
Proportional Reasoning KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Reason quantitatively and use units to solve to problems N.Q.1 N.Q.2 N.Q.3 Interpret the structure of expressions (understanding the parts of an expression) A.SSE.1a A.SSE.1b Create equations that describe numbers or relationships A.CED.1 A.CED.4 Reasoning with equations and inequalities A.REI.1	<ul style="list-style-type: none"> • Ratios • Solving proportions 	<ul style="list-style-type: none"> • Corn-Hog Ratio • Population • Opportunity Cost Marginal Analysis • Ratio and Proportion Lesson and Exercises • Ratio and Proportions – WS • Fertilizer Ratios • Mixed Rations
Rate of Increase/Decrease KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Reason quantitatively and use units to solve to problems N.Q.1 N.Q.2 N.Q.3 Interpret the structure of expressions (understanding the parts of an expression) A.SSE.1a A.SSE.1b Create equations that describe numbers or relationships A.CED.1	<ul style="list-style-type: none"> • Percent of increase/decrease 	<ul style="list-style-type: none"> • Percent Increase and Decrease - WS

A.CED.4 Reasoning with equations and inequalities A.REI.1		
Rates of Change KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Reason quantitatively and use units to solve to problems N.Q.1 N.Q.2 N.Q.3 Interpret the structure of expressions (understanding the parts of an expression) A.SSE.1a A.SSE.1b Create equations that describe numbers or relationships A.CED.1 A.CED.4 Reasoning with equations and inequalities A.REI.1	<ul style="list-style-type: none"> • Slope • Rates of change 	<ul style="list-style-type: none"> • Livestock Weight Gain • Deer Populations (advanced)
Percentages KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Reason quantitatively and use units to solve to problems N.Q.1 N.Q.2 N.Q.3 Interpret the structure of expressions (understanding the parts of an expression) A.SSE.1a A.SSE.1b Create equations that describe numbers or relationships A.CED.1 A.CED.4 Reasoning with equations and inequalities A.REI.1	<ul style="list-style-type: none"> • Percentages 	<ul style="list-style-type: none"> • Whole Farm Budget • Enterprise Budget • Job Cost Estimate • Short Run and Long Run Decisions • Machinery Budget

Measurement

Math Standard	Supporting Content	Related activity
Area KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content standards</u> Apply geometric concepts in modeling situations G.MG.1 G.MG.2 G.MG.3	<ul style="list-style-type: none"> • Triangles • Rectangles • Circles • Trapezoids 	<ul style="list-style-type: none"> • Measurement • Greenhouse Area • Fencing
Surface Area KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content standards</u> Apply geometric concepts in modeling situations G.MG.1 G.MG.2 G.MG.3	<ul style="list-style-type: none"> ▪ Surface area of rectangular prisms ▪ Surface area of cylinders ▪ Surface area of cones ▪ Surface area of spheres 	
Volume KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content standards</u> Explain volume formulas and use them to solve problems G.GMD.3 Apply geometric concepts in modeling situations G.MG.3	<ul style="list-style-type: none"> ▪ Volume of rectangular prisms ▪ Volume of cylinders ▪ Volume of cones ▪ Volume of spheres 	<ul style="list-style-type: none"> ▪ How Much Waste Is There (2).doc ▪ How Much Waste Is There - powerpoint.ppt ▪ Stocking The Silo.doc ▪ Storage Capacities of Buildings and Structures ▪ Measurement ▪ Grain Storage On The Farm ▪ Grain Bins & Grain Bins (diagrams) ▪ Farm Supply Store ▪ Pond Volume ▪ Estimations of Area ▪ Barn Problem
Pythagorean Theorem KCAS	<ul style="list-style-type: none"> • Pythagorean Theorem 	<ul style="list-style-type: none"> • Pythagorean Theorem • Pythagorean Theorem WS

<p>Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content standards</u> Use the Pythagorean theorem to solve right triangles in applied problems G.SRT.8 Compute perimeters and areas of triangles and rectangles using the distance formula derived from the Pythagorean theorem G.GPE.7</p>		
<p>Trigonometry KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content standards</u> Define trigonometric ratios and solve problems involving right triangles G.SRT.6 G.SRT.7 Apply trigonometry to general triangles G.SRT.9 (+) G.SRT.10 (+)</p>	<ul style="list-style-type: none"> ▪ Right triangle trigonometry ▪ Law of sines 	<ul style="list-style-type: none"> ▪ Rafters Notes ▪ Rafter Problems
<p>Measurement Systems KCAS Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #5 Use appropriate tools strategically Math practice #6 Attend to precision <u>Content standards</u> Model mathematics Reason quantitatively and use units to solve problems N.Q.1 N.Q.2 N.Q.3 Math Practice #5</p>	<ul style="list-style-type: none"> • Standard measurements (English & Metric) 	<ul style="list-style-type: none"> • Measuring – Rulers • Reading A Tape Measure • Measuring Segments • Measuring Segments Notes • Metric Conversions • Math Teasers • Agriculture Conversions

Geometry

Math Standard	Supporting Content	Related activity
Geometric Properties Math practice #2 Reason abstractly and quantitatively Math practice #4 Model mathematics in context Math practice #6 Attend to precision Reason quantitatively and use units to solve problems N.Q.1 N.Q.2 N.Q.3 Apply geometric concepts in modeling situations G.MG.1	<ul style="list-style-type: none"> ▪ Interior angles ▪ Area of regular polygons 	<ul style="list-style-type: none"> ▪ Regular Polygon Notes ▪ Regular Polygon Problems

Data Analysis & Probability

Math Standard	Supporting Content	Related activity
Data display KCAS Math practice #2 Reason abstractly and quantitatively Math practice #3 Construct viable arguments and critique the reasoning of others Math practice #4 Model mathematics in context Math practice #6 Attend to precision Summarize, represent and interpret data a single count or measurement variable S.ID.1 Summarize, represent and interpret data on two categorical quantitative variables S.ID.5 S.ID.6 Interpret linear models S.ID.7 S.ID.8 S.ID.9	<ul style="list-style-type: none"> ▪ Scatter plots ▪ Box & whisker plots ▪ Circle graphs ▪ Line graphs 	<ul style="list-style-type: none"> ▪ Culling Beef Cows – box and whisker plots ▪ Raising Hogs
Measures of Center KCAS Math practice #2 Reason abstractly and quantitatively Math practice #3 Construct viable arguments and critique the reasoning of others Math practice #4 Model mathematics in context Math practice #6 Attend to precision Summarize, represent and interpret data a single count or measurement variable S.ID.2 S.ID.3	<ul style="list-style-type: none"> ▪ Mean, median, mode 	(see appendix)
Spread KCAS Math practice #2 Reason abstractly and quantitatively Math practice #3 Construct viable arguments and critique the reasoning of others Math practice #4 Model mathematics in context Math practice #6 Attend to precision	<ul style="list-style-type: none"> ▪ Range ▪ Standard deviation 	<ul style="list-style-type: none"> ▪ Culling Beef Cows - standard deviation.doc

<u>Content Standards</u> Summarize, represent and interpret data a single count or measurement variable S.ID.2 S.ID.3 S.ID.4		
Linear Interpretations KCAS Math practice #2 Reason abstractly and quantitatively Math practice #3 Construct viable arguments and critique the reasoning of others Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Interpret linear models S.ID.7 S.ID.8 S.ID.9	<ul style="list-style-type: none"> ▪ Scatter plots ▪ Trend lines (or lines of best fit) ▪ Making predictions from trend lines 	<ul style="list-style-type: none"> ▪ The Value of the Land.doc
Probability KCAS Math practice #2 Reason abstractly and quantitatively Math practice #3 Construct viable arguments and critique the reasoning of others Math practice #4 Model mathematics in context Math practice #6 Attend to precision <u>Content Standards</u> Understand independence and conditional probability and use them to interpret data S.CP.1 S.CP.2 S.CP.5 Calculate expected values and use them to solve problems S.MD.3 (+) S.MD.4 (+) Use probability to evaluate outcomes of decisions S.MD6 (+)	<ul style="list-style-type: none"> ▪ Probability (Experimental and/or Theoretical) 	<ul style="list-style-type: none"> ▪ Mastitis ▪ Egg Probability

Algebraic Thinking

Math Standard	Supporting Content	Related activity
<p>Graphing</p> <p>KCAS</p> <p>Math practice #2</p> <p>Reason abstractly and quantitatively</p> <p>Math practice #3</p> <p>Construct viable arguments and critique the reasoning of others</p> <p>Math practice #4</p> <p>Model mathematics in context</p> <p>Math practice #6</p> <p>Attend to precision</p> <p><u>Content Standards</u></p> <p>Interpret functions that arise in applications in terms of context</p> <p>F.IF.4</p> <p>F.IF.5</p> <p>Analyze functions using different representations</p> <p>F.IF.7a</p> <p>F.IF.7e</p> <p>Construct and compare linear, quadratic and exponential models and solve problems</p> <p>F.LE.1b</p> <p>F.LE.1c</p> <p>Interpret expressions for functions in terms of the situation they model</p> <p>F.LE.5</p>	<ul style="list-style-type: none"> ▪ Graphing lines ▪ Exponential Patterns 	<ul style="list-style-type: none"> ▪ Graphing Exercises ▪ Graphing Exercises – Key ▪ Bacterial Growth and Continuously Compounded Interest
<p>Equations of trend lines</p> <p>KCAS</p> <p>Math practice #2</p> <p>Reason abstractly and quantitatively</p> <p>Math practice #3</p> <p>Construct viable arguments and critique the reasoning of others</p> <p>Math practice #4</p> <p>Model mathematics in context</p> <p>Math practice #6</p> <p>Attend to precision</p> <p><u>Content Standards</u></p> <p>Create equations that describe numbers or relationships</p> <p>A.CED.2</p>	<ul style="list-style-type: none"> ▪ Algebraic models from tables 	<ul style="list-style-type: none"> ▪ The Value of the Land.doc
<p>Compound Interest/Amortization Tables</p> <p>KCAS</p> <p>Math practice #2</p> <p>Reason abstractly and quantitatively</p>	<ul style="list-style-type: none"> ▪ Compound interest ▪ Amortization tables 	<ul style="list-style-type: none"> ▪ Financing The Farm.doc ▪ Principle and Interest ▪ Amortization ▪ Amortization - Key

<p>Math practice #3 Construct viable arguments and critique the reasoning of others</p> <p>Math practice #4 Model mathematics in context</p> <p>Math practice #6 Attend to precision</p> <p><u>Content Standards</u> Write expressions in equivalent forms to solve problems</p> <p>A.SSE.4 Create equations that describe numbers or relationships</p> <p>A.CED.2 A.CED.4 Interpret expressions for functions in terms of the situation they model</p> <p>F.LE.5</p>		
<p>Using Formulas KCAS Math practice #2 Reason abstractly and quantitatively</p> <p>Math practice #3 Construct viable arguments and critique the reasoning of others</p> <p>Math practice #4 Model mathematics in context</p> <p>Math practice #6 Attend to precision</p> <p><u>Content Standards</u> Create equations that describe numbers or relationships</p> <p>A.CED.2 A.CED.4 Solve equations and inequalities in one variable</p> <p>A.REI.3</p>	<ul style="list-style-type: none"> ▪ Solving equations ▪ Solving inequalities ▪ Using formulas 	<ul style="list-style-type: none"> • Algebraic Formulas • Break Even Analysis • Break Even Analysis (2) • Linear Equations, Inequalities • Work • Work (sheet 2) • Fixed and Variable Costs • Rate of Work Lesson – Notes • Rate of Work Problems - WS
<p>Systems of Equations KCAS Math practice #2 Reason abstractly and quantitatively</p> <p>Math practice #3 Construct viable arguments and critique the reasoning of others</p> <p>Math practice #4 Model mathematics in context</p> <p>Math practice #6 Attend to precision</p> <p><u>Content Standards</u> Solve systems of equations</p> <p>A.REI.6</p>	<ul style="list-style-type: none"> ▪ Pearson Square 	<ul style="list-style-type: none"> ▪ Pearson Square ▪ Pearson Square (sheet 2)

A.REI.7 Represent and solve equations and inequalities graphically A.REI.12		
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